DRAINING OF OIL LEAK IN A HYDRAULIC CYLINDER

This invention regards a device for draining an oil leakage between a piston and a cylinder wall in a hydraulic cylinder, in particular in a single-acting vertical cylinder designed to pull a load through the action of hydraulic pressure, and where the lead-through for the piston rod is located at the upper end of the cylinder.

Hydraulic cylinders that operate more or less continuously, while at the same time being installed in an inaccessible location as regards daily inspections and in surroundings where oil leak is undesirable for environmental reasons, e.g. cylinders used to maintain the prescribed tension in a riser between a subsea borehole for petroleum production and a floating platform, are expensive to maintain when all safety regulations and pollution requirements are to be complied with. Frequent operation calls for extensive maintenance, while inaccessible placement results in complicated operations to gain access to the components, and maintenance will often cause a stoppage in the ordinary production in the plant.

With a functional system for drainage and collection of oil leaking from the cylinders, a greater leakage can be tolerated before the cylinders must be serviced. A longer maintenance interval means a great potential for financial profit. In addition, a secure method of collecting leaked oil will entail environmental profits.

The object of the invention is to remedy the disadvantages of prior art.

The object is achieved by the characteristics stated in the description below and in the following claims.

A single-acting, vertically mounted hydraulic cylinder of a type that is known *per se* has a protruding cylinder rod at the upper end of the cylinder. The piston rod is provided with a piston according to prior art. The piston rod lead-through through the gable wall of the cylinder, and the piston, are provided with suitable seals according to prior art.

Advantageously, the cylinder is supplied with oil through an axial cylindrical passage disposed centrally in the piston rod.

The cylinder is designed to lift a load when connected to a hydraulic system that is known *per se* and when hydraulic pressure is established in a space above a piston in the cylinder.

A bottom plate that fits tightly at a lower end of the cylinder is provided with a drainage channel. The drainage

channel is connected, by means of techniques that are known *per se*, with a reservoir for collection of oil that is drained from a space between the cylinder piston and the bottom of the cylinder.

The bottom of the cylinder is provided with a shoulder for the piston, so as to leave a space between the piston and the cylinder bottom when the piston is pushed fully into the cylinder.

The bottom plate of the cylinder is provided with an air inlet that projects slightly from the bottom, at the most to the level of the piston shoulder in the cylinder bottom. The air inlet is connected, by means of techniques that are known *per se*, with a compressed-air plant that is known *per se*.

When using the cylinder of the invention, hydraulic pressure is introduced at the top of the cylinder piston. Over time, oil will leak between the cylinder wall and the piston seals. The leaking oil collects at the bottom of the cylinder, from where it is drained via said drainage channel. By using said compressed-air plant, the space between the piston and the cylinder bottom is pressurized to a slight overpressure, typically 1.5 bar. As a result of this overpressure the leaking oil will drain to a reservoir which may be placed in a, for this, favourable location high above the cylinder, e.g. on a deck of an oil installation.

The following describes a non-limiting example of a preferred embodiment illustrated in the accompanying drawings, in which:

Figure 1 schematically shows a cylinder according to the invention with an associated compressed-air plant and a reservoir for leaking oil; and

Figure 2 is a longitudinal section through the lower part of the cylinder on a larger scale.

In the drawings, reference number 1 denotes a hydraulic cylinder in which 3 is a cylinder wall, 5 is a piston rod and 7 is a piston. The hydraulic cylinder 1 also comprises a cylinder gable 9 with associated seals 11. The piston 7 is provided with seals 13. The piston 7 divides the cylinder 1 into an upper space 7a on the rod-side of the piston 7 and a lower space 7b.

A cylinder bottom 15 is screwed onto a lower end 19 of the cylinder 1 by means of female threads 17. An annular piston shoulder 21 is placed on an inner wall surface 16 of the cylinder bottom 15. The piston shoulder 21 is provided with seals 23 and fixed to the bottom plate 15 by screws 25. The bottom plate 15 is provided with a drainage channel 27 and an air inlet 29. The air inlet 29 projects above the inner wall surface 16 of the bottom plate 15 at a height of approximately 2/3 of the height of the piston shoulder 21. The drainage channel 27 is connected with a reservoir 28 via suitable tubes 26. The air inlet 29 is connected with a compressed-air plant 30 via suitable tubes 29a.

The piston rod 5 has an axial, central passage 31 that connects the cylinder 1 with a hydraulic system 35 via bores 33, which hydraulic system comprises a pump 35a, a reservoir 36 and control device 36a.

The cylinder 1 is connected to a supporting structure 37 and a movable cast 39.

The hydraulic system 35 is designed to pressurize the upper cylinder space 7a, so that the cylinder 1 supports or moves the load 39 to which it is connected. The seals 13 are subjected to oil pressure. Any oil leak past the seals 13 pass the piston 7 and is collected at the bottom plate 15 of the cylinder 1. The space 7b below the piston 7 is connected to the compressed-air plant 30, which maintains a prescribed pressure, preferably between 1 and 2 bar. By means of said overpressure, any leaking oil that occurs in the lower cylinder space 7b is forced through channel 27 and tube 26 and up to the reservoir 28, in which the oil is collected, possibly to be sent back to the reservoir 36 of the hydraulic system 35.